

Transit facility tests chem/bio counterterrorism technology

Sandians install system in subway station to spot chemical warfare agents

By Nancy Garcia

Like a modern-day smoke detector or fire alarm, new technological systems are under development to spot a chemical or biological attack. Early warning and response systems are being devised under the DOE's PROTECT Program (Program for Response Options and Technology Enhancements for Chemical/Biological Terrorism).

In the first phase of the program, Sandia researchers are contributing to the development and demonstration of chemical warning and response systems for mass transportation systems.

Meant to integrate a layer of protection into existing operations of key need areas, PROTECT was initiated in FY 1998 within DOE's Chemical and Biological Nonproliferation Program as a Domestic Demonstration and Application Program.

A collaboration between Sandia and Argonne National Laboratory, PROTECT addresses vulnerabilities of civilians that were highlighted in the 1995 chemical agent attack in the Tokyo subway system. The program takes advantage of recent advances in technology to prepare for and respond to such attacks in subways, airports, and office buildings where people are concentrated.

To this end, a team of Sandians from California recently helped conduct the first known US installation of long-term chemical agent monitors in a mass transit facility. Sandia is responsible for the chemical detector testbed design and analysis. Argonne is providing an emergency response software tool to alert emergency response crews about the dangers present, including contaminated areas above and below ground, and video of the affected area.

The Sandia programmatic lead for the PROTECT subway program, Susanna Gordon (8112), worked with the subway client through FY99 to develop system requirements, to select the detection hardware for testing, and to plan for the testbed evaluation. With the help of Beth Wichman (2221), the technical lead on the testbed installation, the focus in FY2000 has been on coordinating the participation of all of the participants in the testbed installation, including the Sandia team, the subway system police and engineering staffs, and the detector manufacturer. This culminated in May in the successful installation of a chemical warfare agent monitoring system testbed in a subway station.

The Sandia team — Beth, Ray Trechter (8945), and Robert Kinzel (2221) — worked through four consecutive nights for stretches of 12 to 20 hours to complete installation during the night-time lull in operations. They were assisted by employees of the transit facility and the commercial sensor supplier. Six specialized monitors, each roughly the size of a desktop computer, were installed at points most likely to provide early warning of a chemical agent release (as indicated by facility smoke tests conducted by the Argonne PROTECT team last year). The monitors are connected by fiber optic links to a central data computer. The system uses software previously developed by Sandia's Material Monitoring System project for remote monitoring of stored nuclear material.

This system has the advantage of being easily expanded to include more locations, and can operate with a variety of sensors, said Beth. She applied her earlier experience with the system and expertise in electrical engineering to design the testbed architecture.

Ray modified the software for these particular monitors. Rick Maurer (8930) was invaluable during the system design, advising on appropriate fiber-optic networks, and during the system installation, providing remote assistance to the fiber installation crew. Scott Marburger (8945) is now creating a maintenance interface that will simplify both real-time viewing of the data, as well as access to the data archive.

Getting the infrastructure ready for installation was a bit of a challenge. The team received safety training the first morning and had assistance throughout the nights from the facility's skilled workers. "We were delighted to see the system up and running on schedule early the last morning," Beth says. The end goal is for the facility, which purchased the monitors as a partner in this project, to run the system on its own.

There have been no false alarms with more than 300,000 data points recorded since the system was installed May 22. The system is now being evaluated for accuracy, and any potential degradation from the relatively dusty, dirty environment.

"As our efforts continue," Beth says, "we'll see this evolve into a multisite demonstration, helping integrate the passing of information between sites." After that, the approach will be documented so that other facilities can copy the approach.

This approach should: 1) save lives, 2) allow rapid restoration of operations, 3) show operational benefits while providing feedback for further enhancements, and 4) have a cost in line with the perceived level of threat for any key facilities.

PROTECT researchers are working with three subway systems and an airport authority to apply early warning concepts, crisis management, and mitigation options. In FY 2001, a system demonstration is expected in one subway station, and in FY 2002, a demonstration is planned to include a five-station system. Demonstrations are also being planned at the airport to develop optimal warning and response strategies for large facilities that are mechanically ventilated. Facility assets that might be exploited include highly automated systems that can rapidly change air flow in response to a release, an extensive set of evacuation options to reduce personnel exposure, and an on-site emergency response capability that can rapidly respond with specialized vehicles and equipment.